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Conservation and Energy Efficiency to Achieve the Comfort of The Air Conditioning System in The LTSIT Building, University of Lampung

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Abstract: Conservation and Energy Efficiency to Achieve the Comfort of the Air Conditioning System in the LTSIT Building, University of Lampung. This research was conducted in the context of conservation and energy efficiency to get the comfort of an ideal air conditioning system in the Integrated Laboratory of the Center for Technology Innovation, University of Lampung (LTSIT Unila). This situation is achieved by comparing the temperature of the existing air conditioning system with the SNI standard temperature. This energy conservation also aims to ensure the continuity of the activities of building users and working tools that remain within the Standard. On the other hand, there will be convenience for all building users, including in chemistry practicum. The method in this research is descriptive, data collection using survey methods to obtain facts that occur in the field and interpret the data. The results of this study indicate that the variables owned by the environment in the LTSIT building are at the lower limit of the ideal variables standardized by SNI. The initial temperature is at intervals with concertfasi and variable energy efficiency of the environmental system in the LTSIT building can be returned to a comfortable environment variable, where the initial temperature is at the interval (24.4ºC-28.1ºC) and in the end, the air conditioning system is obtained with room temperature 25ºC.

Keywords: Conservation, Efficiency, Comfort and SNI

***Abstrak**: **Konserfasi dan Efisiensi Energi untuk Mencapai Kenyamanan Sistem Tata Udara di Gedung LTSIT Universitas Lampung.** Penelitian ini dilakukan dalam rangka konserfasi dan efisiensi energy untuk mendapatkan kenyamanan sistem tata udara yang ideal di gedung Laboratorium Terpadu Sentra Inovasi Teknologi Universitas Lampung (LTSIT Unila). Keadaan demikian dicapai dengan cara membandingkan temperature sistem tata udara yang ada dengan temperature standar SNI. Konserfasi energi ini juga bertujuan bagi terjaminnya kelangsungan aktivitas Pengguna gedung dan kerja alat tetap berada dalam Standar. Disisi lain akan didapatkan kenyamanan bagi seluruh pengguna Gedung, termasuk dalam praktikum kimia. Metode dalam penelitian ini adalah deskriptif, pengumpulan data dengan metode survey untuk memperoleh fakta yang terjadi dilapangan dan mengintepretasikan data. Hasil penelitian ini menunjukan bahwa variabel yang dimiliki oleh lingkungan yang ada dalam gedung LTSIT berada pada batas bawah variabel ideal yang distandarkan oleh SNI. Temperatur mula mula berada pada interval dengan konserfasi dan efisiensi energi variabel sistem lingkungan di gedung LTSIT dapat di kembalikan menjadi variabel lingkungan yang nyaman, dimana*

temperaur mula mula berada pada interval (24,4^{o}C-28,1^{o}C) dan pada akhirnya diperoleh sistem tata udara dengan temperatur ruangan 25^{o}C.

***Keyword**: Konserfasi, Efisiensi, Kenyamanan dan SNI*

▪ INTRODUCTION

The development of science and technology that supports human life is always followed by an increase in energy use in all aspects of life. Energy conservation and efficiency are seen as very important things that can ensure a comfortable environment. Regulation of the Minister of ESDEM number 13 of 2012 states that in order to increase savings in electrical energy, it is necessary to use electrical energy efficiently and rationally without reducing safety, comfort and productivity, while the Minister of Energy and Mineral Resources regulation number 14 of 2012 outlines that energy management is an activity integrated to control energy consumption in order to achieve effective and efficient energy utilization. In energy conservation, there is an energy audit that talks about a process of evaluating energy use and increasing comfort as well as recommendations for increasing efficiency in energy users and energy sources in the context of energy conservation.

In the energy conservation process which aims to create comfort, of course, it involves a simple energy audit where the results will be known how much the difference is from the SNI reference standard and how much energy consumption is used. Proper energy consumption is energy consumption in accordance with SNI standards. In this research, what is very important is to increase the comfort in the building by restoring the comfort level with SNI standards consisting of lighting standards, air conditioning system standards and humidity standards, so that a condition is achieved where building users feel comfortable and at home in it.

Survival always requires Energy. The right conservation and energy efficiency will create a comfortable indoor environment. Environmental variables in buildings that support it consist of building lighting systems, indoor air conditioning systems, main equipment as well as administrative and building data processing equipment. This energy need will result in an imbalance and uncontrollable, causing inconvenience to the Integrated Laboratory of the Center for Technology Innovation, University of Lampung (LTSIT). This building also does not deny the use of various experiments related to chemical materials. This chemical material can be applied both in the learning process and in benefits in everyday life. One chemical material can discuss the change in the heat entail of various systems. In connection with the room that meets the standards, it is necessary to carry out various concrete actions.

The actions required include the efficient use of energy through energy conservation through the use of energy which is carried out in a planned, systematic and integrated manner without reducing actual energy needs. In the process of conserving energy, of course, it involves an audit of electrical energy, namely by calculating the consumption of electrical energy that has been used so far. This result will determine how much energy consumption is used, whether the consumption is in accordance with the SNI standard or exceeds the SNI standard, the excess energy consumption from the SNI standard is called a waste of energy consumption. Another action that is also very important is to increase the comfort in the building by restoring the level of comfort

such as lighting, air temperature standards and humidity standards according to SNI standards.

Conservation and efficiency of electrical energy is only directed at creating comfort and savings on the four existing equipment in the LTSIT building, namely laboratory equipment, administrative equipment, air conditioning system equipment and lighting equipment. It is hoped that energy management and audit processes (simple audits) can provide recommendations for energy saving and space comfort in the building.

▪ METHOD

Sampling in this study was carried out randomly using the cluster The method in this research is descriptive. Then a survey was conducted to collect data related to energy management. This research was conducted from July 2020 to December 2020 at the LTSIT Laboratory of the University of Lampung. The character of the building from which you can find out the floors, the number of rooms and the position of the panels, the installation system, the distance between the electrical substation and the building's substation. The character of the air conditioning system that supports the creation of comfort. The electrical installation system is related to the use of the R, S, T lines relating to air conditioning systems. AC or AC data, the data we need on AC equipment is the output data in the form of indoor air temperature and large PK capacity capable of absorbing electric power. The interior and exterior of the building must be equipped with an air conditioning system. Interior and exterior building systems suitable for a certain size humidity system.

Data collection includes; collection of all data as a result of data collection in each room in the building. Selecting and classifying data based on its suitability for the purpose of the research being carried out. Collecting data relating to indoor air conditioning systems.

Data processing. The collected data was then processed and the following data were obtained; Data on temperature of each room that has been collected to be compared with data on standard air systems according to SNI standards**.** The average temperature data from each room is sought to see its proximity to standard data according to SNI data. The average temperature data from each room is sought so that the level of accuracy can be seen with the humidity data according to SNI standards All temperature data must be arranged in such a way so as to achieve comfort that has SNI standards

Data Analysis. The results of the data processing above we examine in detail, compared with the existing standard data according to SNI. There are three possible data conditions**;** Data is less than SNI standard, The data exceeds the SNI standard, Data is in accordance with SNI standards

Recommendations and Room Comfort Management**.** Room comfort recommendation, based on existing normal data then compared with SNI standard data, how big is the difference to achieve SNI standard data by increasing the existing data value if it is still below SNI data standard and lowering existing data if the data is condition above the SNI standard data. In addition, there is also data that needs to be maintained because the data is already in accordance with the SNI standard data.

▪ RESULTS AND DISCUSSION

Table 1 The temperature conditions on the 1st floor before and after the recommended SNI 6197-2011

No	Room	Before Recomendations (^oC)	After recomendation (^oC)	Circumstances Temperature SNI
1	1.1.0	25,4	24-27	Comfortable
2	1.1.1	26,8	24-27	Comfortable
3	1.1.2	26,5	24-27	Comfortable
4	1.1.3	26,2	24-27	Comfortable
5	1.1.4	27,5	24-27	Comfortable
6	1.1.5	26,8	24-27	Comfortable
7	1.1.6	27,4	24-27	Comfortable
8	1.1.7	28,3	24-27	Comfortable
9	1.1.8	27	24-27	Comfortable
10	1.2.0/1/2	28,1	24-27	Comfortable
11	R.1.2.3	24,4	24-27	Comfortable
12	R.1.2.4.1	25,8	24-27	Comfortable
13	R.1.2.4.2	26,4	24-27	Comfortable
14	R.1.3.0	26,7	24-27	Comfortable
15	R.1.3.1	25,5	24-27	Comfortable
16	R.1.3.2	26,2	24-27	Comfortable
17	R.1.3.2.1	25,6	24-27	Comfortable
18	R.1.3.2.2	27	24-27	Comfortable
19	R.1.3.3	27,3	24-27	Comfortable
20	R.1.3.4	26,1	24-27	Comfortable
21	R.1.3.5	26,9	24-27	Comfortable
22	Polymer	26,8	24-27	Comfortable
23	Warehouse	27,4	24-27	Comfortable
24	Analyst	27,5	24-27	Comfortable
25	Das Lab	27,7	24-27	Comfortable
26	Equipment	26,7	24-27	Comfortable
27	Ka-Lab	24,5	24-27	Comfortable

Room comfort level data

Table 2. The state of comfort on the 1st floor before and after recommended SNI 6197-2011

No	Room	Before Recomendations (^oC)	After recomendation (^oC)	Circumstances Temperature SNI
1	1.1.0	Comfortable	24-27	Comfortable
2	1.1.1	Comfortable	24-27	Comfortable
3	1.1.2	Comfortable	24-27	Comfortable
4	1.1.3	Comfortable	24-27	Comfortable

No	Room	Before Recomendations (°C)	After recomendation (°C)	Circumstances Temperature SNI
5	1.1.4	Uncomfortable	24-27	Comfortable
6	1.1.5	Comfortable	24-27	Comfortable
7	1.1.6	Uncomfortable	24-27	Comfortable
8	1.1.7	Uncomfortable	24-27	Comfortable
9	1.1.8	Comfortable	24-27	Comfortable
10	1.2.0/1/2	Tidak Nyaman	24-27	Comfortable
11	R.1.2.3	Comfortable	24-27	Comfortable
12	R.1.2.4.1	Comfortable	24-27	Comfortable
13	R.1.2.4.2	Comfortable	24-27	Comfortable
14	R.1.3.0	Comfortable	24-27	Comfortable
15	R.1.3.1	Comfortable	24-27	Comfortable
16	R.1.3.2	Comfortable	24-27	Comfortable
17	R.1.3.2.1	Comfortable	24-27	Comfortable
18	R.1.3.2.2	Comfortable	24-27	Comfortable
19	R.1.3.3	Uncomfortable	24-27	Comfortable
20	R.1.3.4	Comfortable	24-27	Comfortable
21	R.1.3.5	Comfortable	24-27	Comfortable
22	Polimer	Comfortable	24-27	Comfortable
23	Gudang	Uncomfortable	24-27	Comfortable
24	Analis	Uncomfortable	24-27	Comfortable
25	Lab Das	Uncomfortable	24-27	Comfortable
26	Peralatan	Comfortable	24-27	Comfortable
27	Ka-Lab	Uncomfortable	24-27	Comfortable

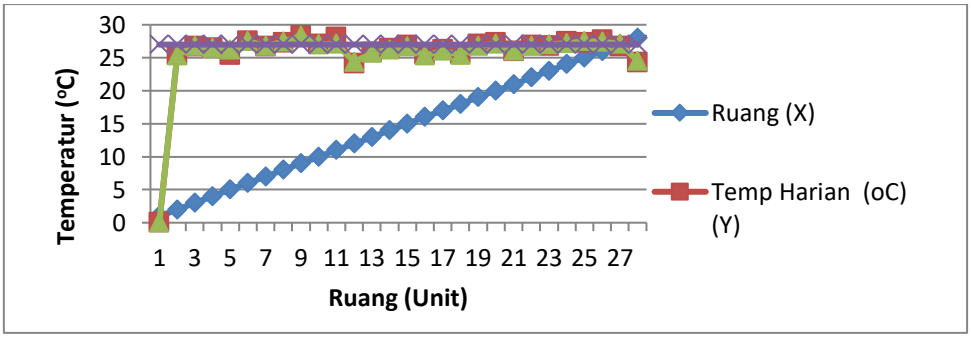

Figure 1. Graph of the relationship between daily temperature and temperature SNI standards for each room in the LTSIT Building

Based on Figure 1, the graph contour between daily temperature and SNI temperature is almost the same, which means the condition of the air conditioning in the building LTSIT is almost ideal. However, the condition of the building is not ideal makes the situation above not last long because of a leak heat out there is also heat that enters through the radiation inside building through doors and windows, as for other conditions that support its creation convenience is

1. The room must be adiabatic
2. The air conditioning system meets SNI standards
3. The room remains ideal

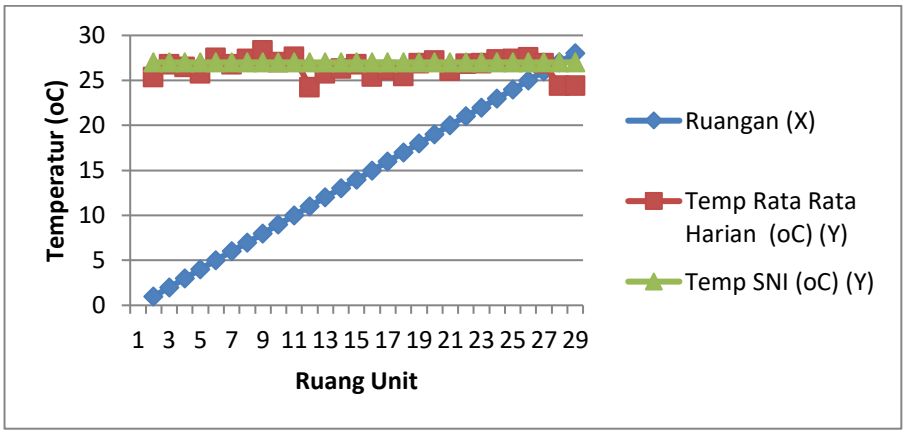

Figure 2. Graph of the relationship between daily average temperature and SNI standard temperature for each room in the LTSIT building

Based on Figure 2, the graph contour between daily average temperatures with SNI temperature almost the same, it means that the condition of the internal air system the LTSIT building is almost ideal. However, this is not always the case are in a state that building users can be aware of. As for the effect which is obtained after a comfortable state of the air system is

1. Building users can work optimally
2. The achievement of work results can be maximized
3. Energy savings in the use of electric power can be increased
4. Building users feel more comfortable living inside
5. Building users away from stress

The process of heat propagation in the air medium is the basis for heat propagation in the room when the AC is turned on. At this time the cold temperature sprayed by the air conditioner throughout the room results in a convection reduction in heat which can be formulated as follows

H = K.A. (dT)
H = K.A. (T2-T1)
Where H = Heat propagating in air (joules m ^ 2oC)
K = Heat convection constant
A = Area of heat propagation (m ^ 2)
dT = Change in temperature (^{o}C)

Energy conservation according to SNI 6390: 2011, is a building air system system, which is a systematic, planned and integrated effort to conserve domestic energy resources and increase the efficiency of their use without sacrificing human comfort demands and or reducing equipment performance (SenoRiyadi, 2016).

The energy management program is a planned program that aims to reduce the budget for energy expenditure in an Integrated Laboratory for Technology Innovation Center or company building (Rizkani.T, 2012). Energy management is an alignment of a company's strategy, so that all employees will be able to commit to saving all forms of energy in a company building (Adipramadan & Ciptomulyono 2012)

Due to the limited availability of energy in nature and the increasing cost of obtaining energy in nature, it is necessary to make a savings in order to reduce the cost of energy consumption and in order to limit the use of energy consumption. The use of energy will obtain information and identify which types of energy still cause energy waste and which types of energy have reached an optimal point in energy consumption.

▪ CONCLUSION

The factor that causes energy waste is indicated by the use of less efficient air conditioning equipment. Energy-saving solutions and increased comfort Savings solutions: For air conditioning system equipment that is optimized and streamlines its work functions and SNI standards. For laboratory equipment the work system is efficient and the results are calibrated with company standards. Comfort solution: for air conditioning systems standardized and adapted to SNI standards. Laboratories that meet the standards can be used including in the chemistry lab for a learning reaction and other benefits. Energy saving solution and increased comfort Savings solution: For optimized air conditioning system equipment and streamlined its work function and standardized SNI. For laboratory equipment the work system is efficient and results its work is calibrated to company standards. Convenience solution: for the air conditioning system standardized and adjusted to SNI standards. Energy management in the context of energy conservation and efficiency to achieve comfort, four physical quantity variables are used, namely: Air temperature: Done by optimizing the work of the air conditioner and by designing it the room is such that there is no heat leak from outside to inside room and from inside and outside the room except through the heat exchange circulation in air conditioners in all rooms that do not meet the SNI standards by 33%. Suggestion to maintain the condition of comfort in the building, special supervision is needed related to comfort so that it can be maintained.

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